Team Shaded Skies: Automatic Shading System

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Objective

Objective Concept Generation

1) Slider movement
2) Shade deployment
3) Track design
4) Light sensors

Concept 1:
- Extension arm
- Flanged wheels
- Light sensors at even intervals on track

Concept 2:
- Collapsible arm
- Ball bearings
- Light sensors on pilot’s headrest

Concept 3:
- Rotating arm
- Cylindrical rollers
- Light sensors clustered near center of track

Final Choice

Cylindrical Rollers

T-Shape

Rotational Arm

Type C

Analysis:

- Nearly two times required speed
- Pitch angle has minimal effects

Prototype and Testing

Parameters Tested:
Slider Speed

Test Results and Future Work

Design Process Summary:
- Identified need for autonomous shade system among pilots
- Selected from feasible concepts using AHP
- Formed detailed and embodiment designs
- Constructed and tested prototype
- Analyzed prototype results

Future Work:
- Verify structural integrity through FEA
- Continue modifying prototype to maximize performance
- Obtain customer feedback
- Enhance business plan

Reflection:
- Customer needs fuel innovation
- PDS acted as a cornerstone in developing components
- Prototyping weaknesses lead to more polished final product

Design Characteristics

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Operation of Product:
- Sensors locate position of sun
- Slider moves shade to block direct sunlight from pilots eyes.

Customer Requirements

- Safe
- Reliable
- Lightweight
- Compact
- Low Cost
- Improve Visibility

Constraints

- Lightweight
- Robust
- Compact

Physics

- Sun
- Autonomous Shade
- Light sensors
- Pilot

Key Innovations:
- Automated shade allows pilot free use of both hands while removing direct sunlight from pilots eyes.

Sacrificed Characteristics:
- Shade movement in three planes: found to be too time consuming for the limitations of this project

Customer Requirements:
- The system is lightweight – made of aluminum
- The system is compact – actual dimensions of slider are 3”x3”x3.2”
- The system is easy to use – activated through an on/off switch and fully automated

Mechanical Engineering Design Day

ENME472 - Integrated Product and Process Design and Development

Date: November 30, 2010